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10/010,412	12/07/2001	Russel Shirley	AMDA.499C1 (TT4002/03C1)	6042

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EXAMINER	
RODRIGUEZ, PAUL L	

ART UNIT	PAPER NUMBER
2125	16

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Please find below and/or attached an Office communication concerning this application or proceeding.

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.

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Commissioner for Patents

The following communication is in response to the REMAND TO THE EXAMINER dated November 24, 2004. In which the board requested that the examiner point out, on the record, where each of Wiesler's patent application publication disclosures, relied upon by the examiner in rejecting appellants' claims, appears in the Wiesler's provisional application.

Because there is no clear one for one mapping from the provisional application (U.S. 60/199453) to the patent application publication (U.S. Pub 2001/0047222), the Examiner provides the following in an attempt to point out each location in the provisional application providing disclosure, along side the references to the disclosure of the patent application publication and appellants' claims as set forth Examiners Answer submitted September 9, 2003.

See attached, where the references to the provisional application are made in bold/italic lettering.

Paul L Rodriguez
Primary Examiner
Art Unit: 2125

Claims 1-6, and 9-14 are rejected under 35 U.S.C. 102(e) as being anticipated by Wiesler et al US Pub 2001/0047222 (***U.S. Provisional Application 60/199453***). The claimed invention reads on Wiesler et al as follows:

Wiesler et al discloses (claim 1) a computer-based automated method for tracking the movement of masks (reticle is considered a mask, paragraph 14 lines 1-2, ***page 7 section 3 lines 1-4, figure 3-1, page 13 section 4 lines 1-3 page 15 section 4.2 lines 1-2, page 16 section 4.3.1 last line "tracking information", page 17 paragraph 2, page 28 section 4.6 lines 1-6***) used in a wafer processing facility (paragraphs 5, 15-17, ***page 5 section 1.1, figure 3-1***), the masks being moved in mask pods (reticle carriers, paragraphs 5, 6, ***page 5, table 1-11, "reticle carrier", page 15 section 4.3 lines 1-6***), the method comprising for each mask, generating mask data that includes a mask identification code (figures 3a, paragraph 19, ***table 4-5, page 19 section 4.4, page 18 section 4.3.4 lines 5-7***), using a computer (reference number 204, ***page 7 "TransNet RMS" server***) to process the mask data, including cross-referencing respective mask identification codes to pod identification codes (figure 3A, Reticle ID, Reticle Carrier ID, paragraph 19, claims 3, 4, ***Table 4-5, page 7 TransNet RMS system"***), updating the mask data to include a facility location identification code (storage of reticle in stocker, figure 3B, Current Location, ***page 15-16 section 4.3, page 18 sections 4.3.3, 4.3.4, table 4-5***), (claim 2) wherein said updating occurs as each mask moves to a subsequent location during wafer processing (figure 3B, paragraph 19, 20, including current and last locations, ***table 4-5, current and last locations***) and said updating includes adding a tool identification code to the mask data set when the mask arrives to a tool location (processing stations, paragraph 15, 19, 20, figure 3B, current and last locations, ***table 4-5 current and last locations, page 18 section 4.3.3, 4.3.4***), (claim 3)

after said updating, further including creating a historical database for the mask data corresponding to each mask and tracking the movement of each mask when the mask arrives to a new location (paragraph 5, figure 3B, current and last locations, paragraph 19, ***table 4-5 current and last locations, page 17 sections 4.3.2, page 18 section 4.3.3, page 16 section 4.3.1 "add or update the additional usage tracking information", table 4-5, page 25 section 4.5.3***), (claim 4) after the updating step, further including the step of providing a material control system that sends a selected mask to a new location (paragraph 17, ***page 15 section 4.3, page 17 section 4.3.2 page 18 section 4.3.3***), thereby triggering all update of the mask data set for the selected mask when the mask arrives to the new location (paragraphs 5, 17, ***Table 4-5, 4-6, page 29 section 4.6.2***), (claim 5) further including storing mask data (paragraphs 5, 19, figure 3, ***Table 4-5***), (claim 6) wherein storing mask data includes using the computer to track the condition of each mask (paragraphs 5, 17, 20, ***page 25 section 4.5.3***), the mask condition including particle contamination, mask degradation, number of exposures, number of times mask is handled and mask structural defects (figure 3E, reference number 310, ***page 23 table 4-7***), wherein the masks are selected from the group consisting of reticles, wafer processing masks and solder bump masks (paragraph 14, ***page 5 section 1.2 "Reticle", "Photo mask"***), (claim 9) further including matching the mask to a carrier (figure 3A, reticle ID, reticle carrier ID, ***table 4-5 "reticle ID", "reticle carrier ID"***), the carrier having a carrier identification code (reticle carrier ID, figure 3B, ***table 4-5 "reticle carrier ID"***) and storing the carrier identification code data as part of the mask data (figure 3B, paragraph 19, ***table 4-5 "reticle carrier ID"***), (claim 10) further including tracking the mask movement from a material stocker, through a stepper and through an inspection tool while in a mask pod (paragraphs 15, 16, ***page 17-18 sections 4.3.2, 4.3.3, page***

28-29 section 4.6), (claim 11) a system (figure 2, paragraphs 17, 18, ***figure 3-1***) for tracking the movement of masks used in a wafer processing facility (paragraphs 5, 6, ***page 7 section 3 lines 1-4, figure 3-1, page 13 section 4 lines 1-3, page 15 section 4.2 lines 1-2, page 16 section 4.3.1 "tracking information", page 17 paragraph 2, page 28 section 4.6 lines 1-6***), the masks being moved in mask pods (reticle carriers, ***page 5, table 1-11 "reticle carrier", page 15 section 4.3 lines 1-6***), the system comprising for each mask, means for generating mask data that includes a mask identification code (figure 3A, paragraph 19, ***table 4-5***), and computer means for processing the mask data (reference numbers 202, 204, ***figure 3-1, page 7 TransNet RMS system***), including cross-referencing respective mask identification codes to pod identification codes (figure 3A, reticle ID, reticle carrier ID, paragraph 19, claims 3, 4, ***Figure 4-5, reticle ID, reticle carrier ID***) and updating the mask data to include a facility location identification code (storage of reticle in stocker, figure 3B, current location, ***figure 4-5 "current location"***), (claim 12) further including a material handling system adapted to move the masks and mask pods to multiple locations in the wafer processing facility (paragraph 16, ***page 7 section 3, figure 3-1***), (claim 13) wherein the mask data set further includes a tool identification code, generated when the mask arrives to a new tool location, that is stored in the computer means (figure 3B, current and last location, processing station, paragraph 15, ***table 4-5, current and last location, page 28-29 section 4.6***), (claim 14) a computer-based automated method for tracking the movement of masks (reticles) used in a wafer processing facility (paragraphs 5, 6, ***page 5 section 1.1***), the masks being moved in mask pods (reticle carriers, paragraphs 5, 6, ***page 5 table 1-11 "reticle carrier", page 15 section 4.3 lines 1-6***), the method comprising for each mask, generating mask data that includes a mask identification code (figure 3A, paragraph 19, ***table 4-5***), using a

computer (reference number 204, ***figure 3-1, page 7 TransNet RMS "server"***) to process the mask data, including cross-referencing respective mask identification codes to pod identification codes (figure 3A, reticle ID, reticle carrier ID, paragraph 19, claims 3, 4, ***table 4-5, reticle ID, reticle carrier ID***) and updating the mask data to include a facility location identification code (storage of reticle in stocker, figure 3B, current location, ***table 4-5 page 28-29 section 4.6***), conducting a degradation analysis on each mask that includes a comparison of the mask data to a mask baseline specification so as to generate degradation data for each mask (figure 3B, inspection, figure 3E, inspection results, paragraph 20, ***page 25 section 4.5.3***), and analyzing and tracking the mask degradation data to determine the useful life of each mask (paragraph 20, ***page 25 section 4.5.3***).

Bib Data Sheet

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APPLICANTS

Oren Wiesler, Wayland, MA ;
Thomas Mariano, Londonderry, NH ;

** CONTINUING DATA **********

** FOREIGN APPLICATIONS **********

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Foreign Priority claimed	STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
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Verified and Acknowledged _____ Examiner's Signature Initials				

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TITLE

Reticle management system

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Reticle Management System

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1. Introduction

1.1. Purpose

The TransNet Reticle Management System (TRMS) is used to facilitate the use of and coordinate the action of PRI hardware components used in an Automated Material Handling System (AMHS) specifically geared for reticle handling. PRI hardware components that make up the TRMS consist of Automated Storage and Retrieval Systems (also known as Stockers), and Aerotrak systems. Automated Storage and Retrieval system used in the TRMS consists of two flavors: Reticle Pod, and Bare Reticle Stockers. Aerotrak systems consist of an Aerotrak controller connected via a network to Aerotrak nodes that are located along the overhead track. Battery operated vehicles run along the track and is controlled by both the nodes and controller.

In addition to the hardware component the following PRI software components are used in the TRMS. They are:

- TransNet RMS
- TransNet MCS
- TransNet Stocker
- TransNet Aerotrak

1.2. Definitions, Acronyms, and Abbreviations

AMHS	Automated Material Handling System
TRMS	TransNet Reticle Management System
AS/RS	Automated Storage and Retrieval System
Stocker	Another name for an AS/RS
Combo Stocker	Stocker containing both a Bare Reticle section and a Pod section.
TransNet	Transport Network - trademark for the PRI AMHS software product suite.
MCS	Material Control System
Aerotrak	Trademark name used for an overhead monorail system used for the delivery of material between AS/RS entities.
MES	Manufacturing Execution System
Reticle Carrier	Any device for carrying Reticles. Examples: Asyst or Empak Pods, Cannon or Nikon reticle boxes.
Reticle	Photo Mask or Negative used in making semiconductors.

Table 1-11 Definitions, Acronyms and Abbreviations

1.3. References

TransNet MCS (V1.1) Functional Specification

TransNet Stocker Functional Specification for software version 1.4+

TransNet Stocker SECS/GEM Manual for software version 1.4+

PRI-7850 RSLS General Product Specification Release 4 (November 20, 1997)

2. Change History

Date	Version	Comment
November 20, 1997	0.0	Initial document
November 21, 1997	1.0	Incorporate comments from colleagues.
December 9, 1997	1.1	Incorporate more comments from colleagues. Added security section.
March 18, 1998	1.1.1	First round of changes from customer feedback. Add CSM special commands. Updated Clean/Inspection processing sections and added new sections on Repair and Re-pelliclization, as well as DB fields for repair, hold and re-pelliclization. Added user group information. Added section on Stand-alone vs. Full System functionality.
February 19, 1999	2.1.1	Added Plan command
March 2, 1999	2.1.2	Updated UI section.
March 4, 1999	2.1.3	Added Chartered specific requirements Create/Delete Reticle and Edit Reticle data command.
April 15, 1999	2.1.4	Incorporate comments and changes from Mike Bugda.

3. Architecture

This section describes the characteristics of the TransNet Reticle Management System architecture at a high level. Overall the Reticle Management System is a software layer that resides between the MES and the TransNet MCS as well as providing the link to attached Bare Reticle Stockers.

Configurations supported by the architecture presented in the following sections are:

- Dedicated Reticle management AMHS system. That being systems that contain any number of both Pod Stockers and Combo Stockers linked with Aerotrak system.
- Single Combo Stockers.
- Multiple Combo Stockers not connected with an Aerotrak system.
- Shared Wafer and Reticle AMHS system. That being a system where the Aerotrak system links both Wafer and reticle TransNet Stockers.
- Single Bare Reticle Stockers
- Multiple Bare Reticle Stockers.

A TransNet RMS system is made up of two internal parts.

- A server that is responsible for all database work in addtion to task coordination and scheduling. Communication both downstream components (TransNet Stockers, and TransNet MCS) and upstream MES hosts are also part of the responsibility of the server.
- A client/user interface is also provided which is responsible for all user interactions, with the system with the exception of the system and database maintenance functions.

NOTE: Communication to upstream hosts is not defined in this specification. Please see the TransNet RMS Host Specification for details.

3.1. Block diagram

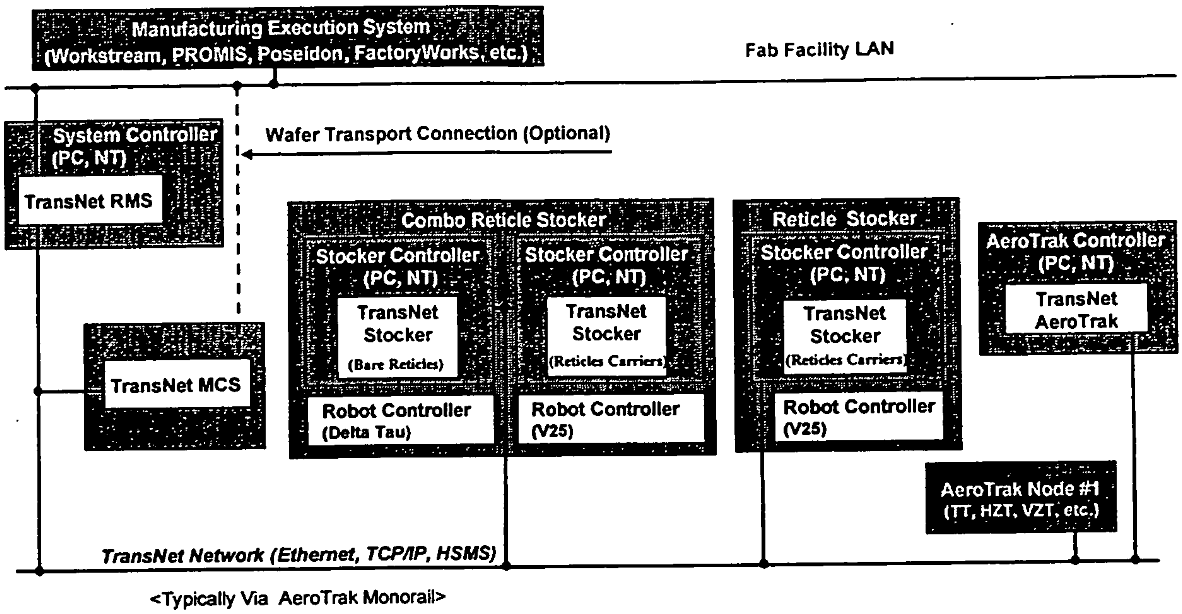

Figure 3-1 Reticle Management System Block Diagram

Note: the dotted line shown in the Figure 3-1 is shown for systems where the MCS doubles as both a reticle pod transport and a wafer pod/box/cassette transport.

Presented in Figure 3-1 is the overall connectivity of the software pieces that can make up a reticle management system. It should be noted from this that the Reticle Carrier Stocker and the Bare Reticle Stocker are treated as independent entities from a software perspective. This has the following features:

- Requires minimal changes to and leverages off of existing software components of TransNet MCS, and TransNet Stocker (both Bare Reticle and Reticle Carrier).
- Separates electrically the two sections of a combo Stocker system and provides better reliability of the whole system.
- Provides a central place, that being the TransNet RMS block, for implementation of customer specific business rules.

3.2. Network Architecture

The simplest configuration of a TransNet RMS is single, a stand-alone Combo Stocker, shown in Figure 3-2. In configurations of this type, the TransNet RMS is housed within the Stocker controller of the bare reticle section of the combo Stocker.

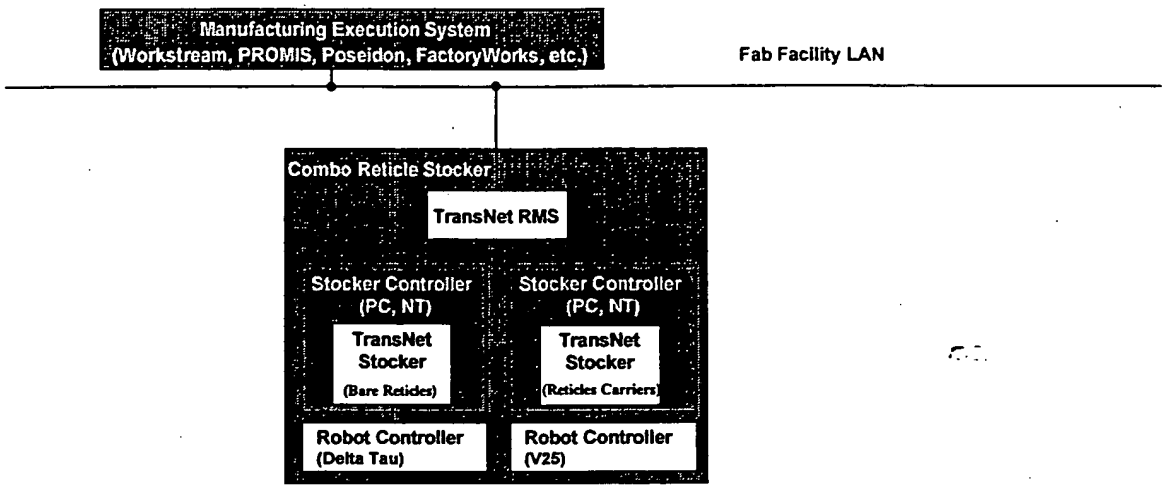

Figure 3-2 Reticle Management System Network Architecture (Stand-alone system)

The next more complex system configuration to consider is where there are more than one combo-Stocker, but no TransNet Aerotrak or TransNet MCS systems. In this type of configuration the TransNet RMS is housed in an independent internal controller. A configuration of this type is shown in Figure 3-3.

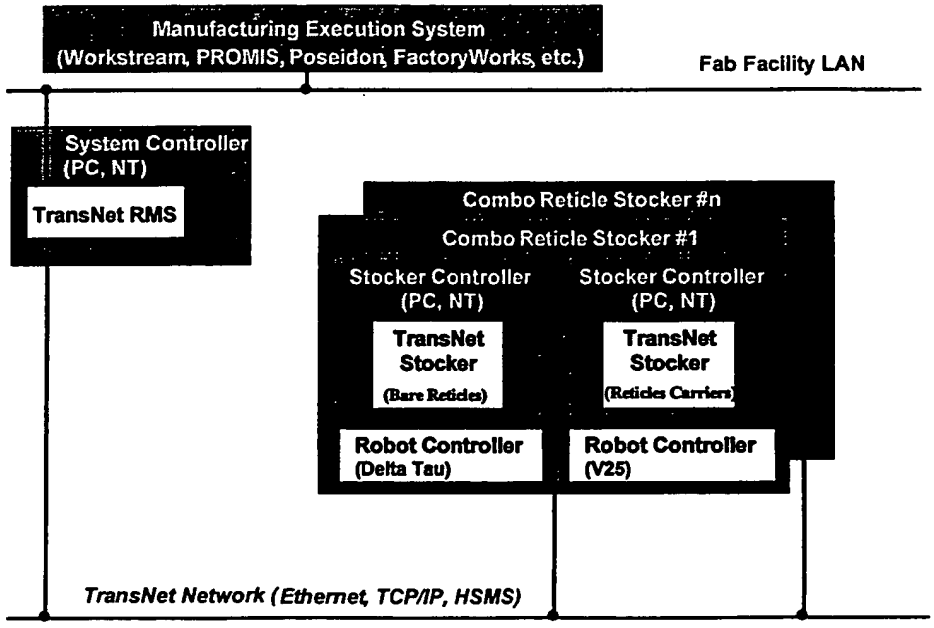

Figure 3-3 RMS Network Architecture (Multiple Combo Stocker configuration)

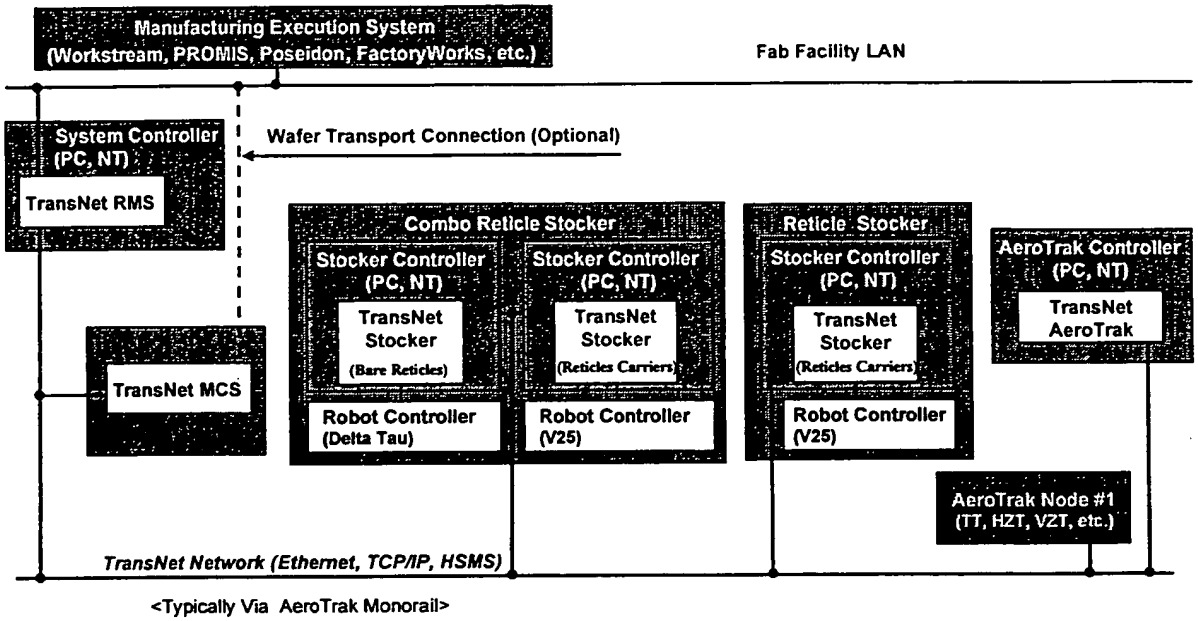

Figure 3-4 Reticle Management System Network Architecture (Full System)

Shown in Figure 3-4 is the most complex or full system configuration for a TransNet RMS. In this configuration TransNet RMS resides on the system controller along with the TransNet MCS.

3.3. Dependent Layered Products and Hardware Requirements

3.3.1. Dependant Software

- Operating system: Microsoft Windows NT version 4.0 or later. Service Pack 3 or later.
- Development platform: Microsoft Visual C++ version 5.0 or later.
- ActiveX Data Objects (ADO) Version 2.0 or later.
- Database platform: Microsoft SQL Server version 6.5 or later. {Server} Microsoft Access 97 or later (Jet 3.51) {Stocker, and Stocker Manager}
- Internet Explorer Version 4.01 SP1 or later.

3.3.2. Server computer Hardware

- Typical Hardware platform: Micron Netframe 2100 or Digital 6100 200 Mhz Pentium Pro or 450 Mhz Pentium II or III (minimum)

128MB RAM (minimum)
2 - 4Gigabyte hard disk drive configured as mirrors (minimum)
or 8G Raid configuration.

- Network platform: Ethernet Network card with BNC and RJ45 connector. {PCI bus or ISA bus based.}
- Display: capable of 1024x768 resolution (minimum).
- Pointing device: Trackball or Mouse.
- (Optional) Un-interruptible Power Supply (UPS): compatible with native NT UPS support and capable of a minimum of 400kVA.

3.3.3. Stocker computer Hardware :

- Typical Hardware platform: Micron Millenia series PC w/

  266 MHz Pentium processor (minimum)
  64MB RAM (minimum)
  1.2Gigabyte hard disk drive (minimum)
- Network platform: Ethernet Network card with BNC and RJ45 connector. {PCI bus or ISA bus based.}
- Display: capable of 1024x768 resolution (minimum). To be located on all Stockers.
- Pointing device: Touch Screen or Trackball or Mouse. Up to two can be used in conjunction assuming that one is plugged into the PS/2 port and the other is plugged into an available serial port.
- (Optional) Uninterruptible Power Supply (UPS): supporting native NT UPS support, and capable of a minimum of 400kVA

3.3.4. TransNet Reticle RMS Stocker configurations supported

3.3.4.1.Bare Reticle Stocker Configurations

This may or may not be attached to a Reticle carrier stocker.

- Delta Tau Robot controller
- Bare Reticle Manual Operator IO ports - any number

- Infab SMIF Pod Opener Operator IO ports - any number. Used as both internal and external opener mechanism for combo stocker configurations.
- Bare Reticle Bar code readers supported:
  - Opticon
- Reticle Bar code readers supported: Opticon.
- Reticle Carrier ID readers supported:
  - Asyst Smart Tag system - reading and writing tag data
  - Infab Intrak Tag system - reading and writing tag data
  - PSC Bar Code reader – reading only
  - Symbol Technology Bar code reader – reading only

3.3.4.2.Reticle Carrier Stocker

Reticle Carrier stockers may or may not be attached to Bare Reticle stockers.

- PRI V25 Robot controller
- SMIF Pod Manual Operator IO ports - any number
- SMIF Pod Automated Operator IO ports - any number
- Aerotrak interface (HZT) - only one allowed.
- Reticle Carrier ID readers supported:
  - Asyst Smart Tag system - reading and writing tag data
  - Infab Intrak Tag system - reading and writing tag data
  - PSC Bar Code reader – reading only
  - Symbol Technology Bar code reader – reading only

4. Functionality

The main intent of this system is to provide an easy and efficient system by which operators can view, and manage Reticles. Reticles are the main object manipulated in this system; movement of their carriers is corollary.

4.1. Security

There will be several levels of security on the system to allow unlimited access for recovery and diagnostics, and restricted access for normal operations. A higher security level has all rights of the lower levels.

- Level 1 (Highest) - This level should only be granted to qualified site personnel. This level will be able to perform system diagnostics and debugging. This person will be able to bring the system down and change system settings.
- Level 2 - This is generally limited to system maintenance personnel. This level of security will allow the user to recover from device or hard errors, administer users and alter some customer information.
- Level 3 (Lowest) - Will be able to perform normal operational system functions including recovering from low-level, non-destructive system errors.

Upon system startup a default user is logged into the system. This user can be of any level. No network or system administrator need be present to start the system. Only Level 1 users have access to direct system functions.

Table 4-1 User Name to Security Level Association shows a typical security information database detailing some default usernames and associated security levels. This information is site configurable. Additional names can be added. One use is to allow for additional information tracking in log files, etc.

User Name	Security level
Operator (default)	Level 3
Supervisor	Level 2
Administrator	Level 1

Table 4-1 User Name to Security Level Association

Taking this a step further, commands allowed for a typical configuration are shown in Table 4-2 Command to User Name associations:

	Operator	Supervisor	Administrator
Retrieve	X	X	X
Store – simple	X	X	X
Store – with clean/inspect options		X	X
Move		X	X
Scan	X	X	X
System's controls			X

Table 4-2 Command to User Name associations

Each user is also assigned group attributes. These pertain to what type of reticle tracking data they are allowed to manipulate and access. Table 4-3 User Groups is a listing of the supported groups and their associated functions. Users can be part of multiple groups.

Group Name	Group Function
Process Group	Allowed to access Reticles marked for process.
Inspection Group	Allowed to access Reticles marked only for Inspection.
Clean Group	Allowed to access Reticles marked only for cleaning
Repair Group	Allowed to access Reticles marked only for repair.
Re-pellicle Group	Allowed to access Reticles marked only for re-pelliclization.
Hold Group	Allowed to access Reticles marked only for hold.
Discontinue Service Group	Allowed to mark Reticles as discontinued from Service.

Table 4-3 User Groups

The default user names created and their assigned groups are shown in Table 4-4 Default Users and Group Assignments

User Name	Group Assignments
Operator	Process Group

Clean Operator	Clean Group
Clean Supervisor	Process Group, Clean Group, Hold Group
Supervisor	All groups
Inspect Operator	Inspection Group
Inspect Supervisor	Process Group, Inspection Group, Hold Group
Repair Operator	Repair Group
Repair Supervisor	Process Group, Repair Group, Hold Group
Re-pellicle Operator	Re-pellicle Group
Re-pellicle Supervisor	Process Group, Re-pellicle Group, Hold Group
SuperUser	All groups
Administrator	All groups

Table 4-4 Default Users and Group Assignments

4.2. Reticle Creation and Deletion

During system startup, inventory of all the stockers is performed in order to generate the set of reticles within the system. It is assumed that all reticles are out of the system at startup and it is the stockers local information that is used to populate the global list. Once this reconciliation process has taken place any new elements are automatically added to the global listing of reticles, though this is configurable. A system-wide setting of AllowNewReticles enables/disables this functionality. If automatic reticle creation is disabled is up to an outside system (host or user interface) to create and delete reticles. While in this mode, reticles not found in the global list will be rejected.

4.3. Commands

A reticle management system, in general, provides operators with the means to store and retrieve Reticles. In both inputting (storing) and remotely retrieving Reticles, operators are given the ability to choose the destination.

Commands, which have the source and destination locations of different types (bare reticle or pod), go through a step of either kitting or un-kitting, also referred to as transformation. Listed below is the set of commands available to users.

- User Store
    - Reticle. {possible: implied un-kitting}
    - Reticle Carrier but first mapping contents.

- Map Reticle Carrier contents and return Reticle Carrier to user.
- Reticle and return Reticle Carrier to user.
- All the above can also be to a remote Stocker for AMHS equipped systems.

- User Retrieve/Pull
  - From current Stocker
  - From remote Stocker. (Only valid in configurations with AMHS functionality.)
  - With implied kitting (if needed).
  - Reticle. {possible: implied kitting}
  - Reticle Carrier
  - All the above can also be to a remote Stocker for AMHS equipped systems.
- User Move
  - Within a Stocker. {can imply kitting or un-kitting}
  - Between Stockers (Push)
- User Scan
  - For Presence
  - For Identity (Reticle Carrier on systems that are AMHS equipped.)
- User Command Cancel

The following sections detail each operation.

4.3.1. User Store

Upon placement of the payload, either bare reticle or reticle carrier at an operator I/O the TRMS system will automatically store the payload on a local shelf. Prior to placing the payload, a user may select the manual exception option. This allows users to select the additional options for storing. The available options are:

- Map Reticle Carrier and return to user.
- Map Reticle Carrier and store to shelf.
- Empty Reticle Carrier, storing both Reticle and Reticle Carrier.
- Empty Reticle Carrier, storing Reticle and return Reticle Carrier to user.
- Store with any of the above options to an alternate Stocker.
- Add or update the additional usage tracking information.

Should the current location be a reticle carrier Stocker and the destination Stocker be a bare reticle Stocker then the TransNet RMS will coordinate the set of commands necessary to move the payload from source to destination. During this type of transfer the reticle carrier is unloaded. If at the end of the command an empty reticle carrier results, then additional commands may be generated by the TransNet RMS system based upon the empty reticle carrier management criteria being applied (see section 4.5.1 - Empty Reticle carrier Management.)

An assumption is made by the TRMS system that the intention declared about the usage of the reticle upon retrieval is what has taken place. If the reticle was retrieved for any other reason that simple process usage, upon storage an entry is created in a validation queue. Validation queue entries need servicing by qualified persons prior to the system allowing the reticle to be retrieved again for any purpose. It is with this mechanism that the TRMS data is validated thus ensuring proper input of the tracking information. A qualified person is someone belonging to the same user group as the process done to the reticle. For example: All persons retrieving Reticles for inspection belong to an Inspection group. These persons are allowed to service inspection validation queue entries.

4.3.2. User Retrieve/Pull

Displayed at the operator's screen is a listing of the material available for retrieval. Because of the central database architecture of TransNet RMS, this view can contain all the material within the system. The user interface can be configured as to how much of the database is shown to a given user based on an individually configured database query. Thus, different users can have different views of the system from the same operator console.

Once the needed material is found in the list by the operator, it is selected and a retrieve command is issued. Implied by this approach is that the destination of the retrieve is the first available output port closest to where the operator is physically located.
Along with the reticle to be retrieved, the intention about the reticle usage must be declared. Multiple retrieve commands may be presented to the user. The list can include the following options for retrieve and is configurable per user:

- For Process
- For Inspection
- For Cleaning
- For Re-pelliclization
- For Repair
- For Discontinued Service
- Any combination of the above

4.3.3. User Move or Push

After selecting a reticle in the material view, the operator can instead of selecting retrieve, select move. The TransNet RMS will respond with a dialog box listing all the available Stockers that this element can be moved to. Upon selection of a Stocker from this list the TransNet RMS will move the reticle to the new destination. If the Stocker selected is the current one then an additional dialog will be presented to the user to specify the exact location or wildcard to move the element to. If the Stocker selected is not the current one then a set of internal commands are generated by TransNet RMS to move the element to the new destination.

4.3.4. User Scan

Each Stocker has the ability to scan its shelves in order to verify its contents. Reticle carrier Stockers only have the ability to validate presence on a shelf. Bare Reticle Stockers have the ability to validate not only presence but also the identity of the material at a shelf. This ability is provided to users.
If a Reticle Carrier is scanned for identity on systems equipped with AMHS the TRMS will send the Reticle Carrier to a Bare Reticle system for identification and return it upon completion of the contents scan.

4.3.5. User Command Cancel

Commands not in progress are allowed to be canceled by an operator. Once a command has started execution it cannot be canceled.

4.4. Attributes

Writer's Note: Attributes shown in the following tables are shown to give an indication of what data is used by the system in order to provide the functionality. It does not represent the actual database architecture to be used or in any way totally define the information that is kept by the system.

Attributes stored about each element (reticle and reticle carrier) in the system are as follows, in Table 4-5:

Attribute Name	Attribute Type	Attribute Definition
Reticle ID	Character string (255-char. max.)	Primary key. Identity of the reticle. Must be unique. Empty Reticle carriers are assigned unique Reticle ID by the system.
Reticle carrier ID	Character string (255-char. max.)	Secondary Key. Identity of the reticle carrier within which the reticle is now housed. It is blank if not kitted, can contain duplicates for the case of multiple Reticles per reticle carrier.
Times Retrieved	32-bit unsigned Long	Number of times reticle has been retrieved.
Date Last Retrieved	Date/time	Date and time this reticle was last retrieved.
Last Retrieve User ID	Character string (255-char. max.)	User name of the operator who last selected this reticle for retrieve.
Times Stored	32-bit unsigned Long	Number of time the reticle has been stored
Date Last Stored	Date/time	Date and time the reticle was last stored for use.
Last Stored User ID.	Character string (255-char. max.)	User name of the operator who last stored this reticle after it was used (not cleaned or inspected).
Times Cleaned	32-bit unsigned Long	Number of times this reticle has been cleaned
Date Last Cleaned	Date/time	Date and time the reticle was last stored after being cleaned.
Last Cleaned User ID	Character string	User name of the operator who last stored

	(255-char. max.)	this reticle after being cleaned.
Cleaned By	Character string (255-char. max.)	Identity of reticle cleaner.
Location Cleaned	Character string (255-char. max.)	Identity of location where reticle was last cleaned.
Times Inspected	32-bit unsigned Long	Number of times this reticle has been inspected.
Date Last Inspected	Date/time	Date and time this reticle was last stored after being inspected.
Last Inspected User ID	Character string (255-char. max.)	User name of the operator who last stored the reticle after being inspected.
Inspected By	Character string (255-char. max.)	Identity of reticle inspector.
Location Inspected	Character string (255-char. max.)	Identity of location where reticle was last inspected.
Last Kit Time	Date/time	Date and time when this reticle was kited.
As Reticle carrier Time	Delta time	Cumulative time this reticle has spent in a reticle carrier. This is independent of the reticle carrier. Only updated upon an un-kitting transformation.
Last Un-Kit Time	Date/time	Date and time when this reticle was un-kitted.
As Bare Time	Delta time	Cumulative time this reticle has spent in a bare reticle Stocker. This is independent of the Stocker. Only updated upon a kit transformation.
Date Entered	Date/time	Date and time this reticle was first entered into the system.
Creator User ID	Character string (255-char. max.)	User name of the person who created the reticle. Assigned when Reticle created.
Keep Kitted	Boolean	True/False indication of whether the reticle is to stay in the reticle carrier independent of automatic aging.
Current Location	Character string (255-char. max.)	Current location of reticle.
Last Location	Character string (255-char. max.)	Previous location of reticle.

Last Reticle Repair	Date/time	Date and time the reticle was last repaired.
Repair Count	32-bit unsigned Long	Number of times the reticle has been repaired.
Last Re-pelliclization	Date/time	Date and time the reticle was last re-pellicled.
Re-pelliclization Count	32-bit unsigned Long	Number of time the reticle has been re-pelliclized.
Hold Time	Date/time	Date and time the reticle was put on hold. This is blank when not on hold.
Hold User ID	Character string (255-char. max.)	User name of the person who issued the hold.

Table 4-5 Reticle Attributes

Also kept within the system are attributes about each transport component (Stocker or Aerotrak) making up the system, as shown in Table 4-6.

Attribute Name	Attribute Time	Attribute Definition
Transport Name	Character string (255-char. max.)	Primary Key. Customer designation given to each Stocker or Aerotrak. Must be unique.
Transport Type	Enum (reticle, reticle carrier, Aerotrak)	Definition of what type of transport.
Transport Capacity	32-bit unsigned Long	Number of locations within the Stocker. Not valid for Aerotrak
Transport Capacity High Water Count	32-bit unsigned Long	Number of shelves allowed to keep full within a transport. Not valid for Aerotrak.
Empty Reticle carrier Count	32-bit unsigned Long	Number of empty reticle carriers contained with in this Stocker. Only valid for reticle carrier Stockers.
Empty Reticle carrier High water Count	32-bit unsigned Long	Value set to determine highest number of empties allowed in system. Used in aging and empty management. Only valid for Reticle carrier Stockers
Empty Reticle carrier Low water Count	32-bit unsigned Long	Value set to determine the lowest number of empties allowed in system. Used in aging and empty management. Only valid for Reticle carrier Stockers.
Port Name List	Character string (255-char. max.)	Semicolon delimited list of the port names reachable by this Stocker.
Port Type List	Enum list (reticle, reticle carrier, Aerotrak)	List of enumerated type indicating the type of port specified in the name list.
Age Interval	Delta time	Amount of time this transport uses the determine reticle carrier usage aging.
Age Tier Level	32-bit unsigned Long	Used to determine tiering of system. Gives an indication of ranking of this transport in relation to others.

Table 4-6 Transport Attributes

Table 4-7defines the attributes that apply system wide.

Attribute Name	Attribute Time	Attribute Definition
Inspection Max	32-bit unsigned Long	Maximum number of times a reticle is allowed to be inspected.
Inspection Bare Interval	Delta time	Amount of time a reticle is allowed to be bare between inspections.
Inspection Reticle carrier Interval	Delta time	Amount of time a reticle is allowed to be kitted between inspections.
Uses between inspections	32-bit unsigned Long	Number of uses allowed between inspections.
Clean Max	32-bit unsigned Long	Maximum number of times a reticle is allowed to be cleaned.
Clean Bare Interval	Delta time	Amount of time a reticle is allowed to be bare between cleanings.
Clean Reticle carrier Interval	Delta time	Amount of time a reticle is allowed to be kitted between cleanings.
Uses between cleanings.	32-bit unsigned Long	Number of uses allowed between cleanings.
Reticle carrier Aging check interval	Delta time	Time between checks are made to determine reticle carrier age and possible tier degradation.

Table 4-7 System Attributes

4.5. Special Functions

4.5.1. Empty Reticle carrier Management

Important to the operation of the system as a whole is to maintain an inventory of empty reticle carriers that are available for kitting operations. As such the count of the number of empties is maintained at each Stocker. Two counts are kept a high water and low water mark. High and low water marks are kept on a per Stocker basis in order to allow for system wide optimizing of the location of empty Reticle Carriers.

The high water mark is used to determine a top end number of empties that should exist within a system. This is used in the decision process of where to place an empty. The high water mark also serves as a means for not allowing the system to be totally emptied.

The low water mark is used to determine a minimum count of empties to be kept in a system. Once the number of empties reaches this low water mark, the system will start moving empties from other Stockers until the Stocker reaches the high water mark or start emptying reticle carriers based on the reticle carrier aging criteria. Since it is most important to have empties closest to reticle carrier openers where kitting will take place, preference over location of empties is given to combo Stockers.

Empty Reticle Carriers can be entered into system in two ways. Either via un-kitting or manual placement at an I/O. Empties are used up by either retrieving an empty, or by the kitting process.

Algorithm:

- If number of empties exceed high water mark then move to a Stocker where count is below high water giving first choice to combo Stockers.
- If no available locations exist then leave in current Stocker. No available locations is determined when all Stockers have reached high water mark..
- If number of empties drops below low water mark a request for an empty to be delivered from an alternate Stocker is made. Empties are first taken from non-combo Stockers.
- If no empties exists then Reticle carrier Aging (see section 4.5.3 for more details) is used to determine what reticle carrier can be emptied.

4.5.2. Empty Shelf Management

In order to maintain available shelf locations for input and output, a number of empty shelves need to reserved. This is determined by the difference between the capacity and high water count kept for each transport.

Once a transport has reached its high water mark, the system goes through the aging process (see section 4.5.3 for more details) in order to decide how to best return back to an acceptable value.

4.5.3. Reticle carrier Aging

In order to maintain available empties within the system, an algorithm must be in place in order to determine what reticle carriers can be re-used. One such algorithm is reticle carrier aging. The basic principle applied here is that frequently used Reticles should be kept kitted (in reticle carriers), and less frequently used Reticles should be kept un-kitted (bare).

As reticle carrier are not used, they age. But an age needs to be applied over a given interval of time. Maintained for each transport is an age interval and age tier level. Once a reticle carrier has reached its age limit for the transport it is a candidate for a tier level degradation. This can be in a couple of forms. One is to un-kit the reticle carrier. The other is to move the kitted reticle carrier to another Stocker. Tier level degradation is only applied should there not be a possibility of moving the element to another transport on the same tier level.

Each transport is assigned an Age Tier Level. This value determines how each transport is age ranked. When tier level degradation is applied, transports with an Age Tier Level less than the current one are selected as candidates for the move. A further refinement of this list is made based on current element location, that being attached Stockers are tried first.

Requests to age reticle carriers come from three sources. One is a request made for an empty that can not be satisfied by an available empty (see section 4.5.1 - Empty Reticle carrier Management for more details). Another is a result of a periodic checking of reticle carrier age. This period is determined by a system wide value. The last being a determination that the high water mark for total capacity has been reached (see section 4.5.2 - Empty Shelf Management for more details).

4.5.4. Move Priorities

Each type of system generated move, whether it be a result of reticle carrier aging or tier degradation, etc. can be configured to have a priority relative to other commands. Site specific configuration settings are used to setup these values. Priorities of commands range from 0 to 9 with 9 being the highest.

System Generated Move Cause	Default Priority
Reticle carrier Aging	3

Tier Degradation	5
Empty Reticle carrier Moves	5
Empty Shelf Moves	5

Table 4-8 System Move Priorities

4.5.5. Inspection

During reticle usage, reticles are periodically inspected for cleanliness and defects that might be building up as a result of usage. It is important for the TransNet RMS to track information about inspections.

Tracked is the number of times a reticle is inspected since it was created in the system, where it was inspected (Equipment name and/or vendor), when it was inspected (Last date/time of inspection), and who (User name) did the operation. Once the system wide defined maximum has been reached; this reticle is tagged as needing resetting and can not be retrieved until the count has been reset. A value of zero for the maximum number of inspections disables this functionality.

Three additional system wide parameters are used to assist in the maintenance of Reticles. One is the count of uses between inspections. The other two values are time intervals that a reticle is allowed to either be bare or kitted (in a reticle carrier) between inspections. For all these values, zero is defined as infinite uses or amount of time. When the reticle is stored, these values are checked. If any of the limits are exceeded the reticle is tagged by the TRMS system as needing inspection and will only be allowed to be retrieved for inspection.

4.5.6. Cleaning

During a period reticle usage, Reticles are periodically cleaned. It is important for the TransNet RMS to track information about cleanings.

Tracked is the number of times a reticle is cleaned since it was created in the system, where it was cleaned (Equipment name and/or vendor), when it was cleaned (Last date/time of cleaning), and who (User name) did the operation. Once the system wide defined maximum has been reached; this reticle is tagged as needing resetting and can not be retrieved until the count has been reset. A value of zero for the maximum number of inspections disables this functionality.

Three additional system wide parameters are used to assist in the maintenance of Reticles. One is the count of uses between cleanings. The other two values are time intervals that a reticle is allowed to either be bare or kitted (in a reticle carrier) between cleanings. For all these values, zero is defined as infinite uses or

amount of time. When the reticle is stored, these values are checked. If any of the limits are exceeded the reticle is tagged by the TRMS as needing cleaning and will only be allowed to be retrieved for cleaning.

4.5.7. Reticle Repairing

An additional type of retrieval intent is for repairing. No quotas are kept and checked about the frequency of repairs. All that is kept is date and time of the last repair and the number of times the reticle has been repaired.

4.5.8. Re-pelliclization

An additional type of reticle retrieval is re-pelliclization. No quotas are kept about the frequency of re-pelliclizations. All that is kept is the date and time of the last re-pellicliziation and the number of times the reticle has been re-pellicled.

4.5.9. Holds

A reticle may be placed on hold. No retrieves of any kind are allowed on Reticles laced on hold. All that is kept about reticle holds are date and time of hold and user name issuing the hold. Only users in the Hold group and the host are allowed to change hold status of a reticle.

4.5.10. Discontinue from Service

A reticle may be marked as discontinued from service. The properties of this attribute are identical to Holds in that when applied remove the reticle from use. The difference is in the meaning. Remove or Discontinue from service means the reticle is obsolete and is tagged archiving. Hold on the other hand, also removes the reticle from service but is intended only to be used as a temporary hold in order to adjust for a process yeild problem or the like.

4.6. Move Planning

In order to optimize and improve delivery times to the operators or to specific equipment there needs to be a means of communicating to the TRMS which reticles are to be used in the not to distant future and where they are needed. With this information the TRMS can issue the moves of these reticles to the intended region in an optimal manner. Generally, this type of planning information is to be provided by a host, but the architecture does not limit to this only.

Writer's Note: The following sections talk in general about the functionality provided as a result of move planning. It in no way represents the actual data format for the information transferred, but is to serve as a means of discussion only. Please consult the TRMS Host interface specification for the syntax and scenario information for host communication of this information.

4.6.1. Move Plan Creation

A move plan is created by sending to the TRMS a set of data consisting of tuples of information shown in Table 4-9 Move Plan Tuple Information.

Tuple Name	Tuple Definition
Reticle ID	Unique identification number for a reticle.
Desired Transport	Transport where reticle is to be put as a result of the execution of this plan.
Desired Storage Location	Storage Location where reticle is to be put as a result of the execution of this plan. Wildcards are allowed.
Desired Time	Date/Time when reticle needs to be at the desired transport/location pair.

Table 4-9 Move Plan Tuple Information

An unlimited number of tuples are allowed as part of a single move plan.

The word location is used in later sections to refer to the pairing of Storage Location and Transport. Both these items are needed to fully define a location with a TRMS system.

It is assumed by the TRMS that a move plan is to be sent in its entirety. A single command must be used to communicate all the reticles for a given plan. Only one plan can be in place at time. Subsequent plans are assumed to update and/or remove the existing plan. The plan information will be overwritten for reticles already in the current move plan. Any new reticle IDs listed in the subsequent plan will be added to the current plan.

4.6.2. Move Plan Execution

Once a move plan is created, the TRMS makes a best effort attempt at satisfying the move plan. The TRMS accomplishes this by attempting to ensure that the reticles listed in the plan will be at the desired location at the desired time. No errors are issued as a result of not being able to achieve a given plan.

No guarantee is made about achieving this goal. Since a move plan maybe impossible to achieve based system performance at the time of the plan. Results of the plan can be queried either by the host or through the user interface to see progress against the plan. Results are reported on an ongoing basis, thus not only the plan final outcome can be seen but also its progress.

Execution of the plan begins with ordering the plan according to earliest desired time, then by order received in the plan command. Once ordered, commands are issued by the TRMS to move the reticles to their desired location. No checking is done to see if the result of the plan execution will have bad operational side effects. Examples of bad operational side effects are: Filling up of a given transport; Or that the execution of later commands in the plan result in early arrivers into a transport get bumped out. What is ensured is that once the reticle arrives at the desired location it won't be bumped out as a result of aging or empty carrier management criteria.

4.6.3. Move Plan Termination

A move plan in completed once all the reticles listed in the outstanding plan have reached the desired location. A move plan can be cancelled by updating the plan to have no elements. Reticle Ids can be removed from a move plan by sending a reticle ID with no associated desired location information.

Once a plan has terminated all the reticle Ids associated with the plan are considered off-limits as far as reticle carrier aging rules and other server generated commands. A move plan with no elements removes this restriction.

Stand-alone versus System Functionality

Since the TRMS System is a network system and each part of the system is key in the full system functionality. When a Stocker, for example, is operated without connection to the Stocker only a subset of the information and checks are done. Stand-alone operation of the Stockers allows for continued use of the system for retrieval and storage of Reticles. Though, no system wide constraints are checked. These are termed Reticle Management business rules. They are as follows:

- Reticle Carrier aging.
- Automatic selection of empty for kitting.
- Maintenance of the proper number of empties within a system.
- Inspections and Cleanings limit checking, both by count and by age.

4.7. Graphical User-Interface

Part of the reticle management system is a configurable Web based graphical user-interface (GUI). An instance of this interface is to be run at each operator I/O location of each Stocker and it is meant to replace the traditional Stocker graphical user interface. Additionally supported configuration is one where an instance of the user interface is to be run on a PC not internal to the stocker, but has Internet connectivity to the stocker, that being can web browse the stocker.

Generally in a TRMS environment the user interface is setup to view the entire TRMS database. As such users are presented with the information about all elements within the system, independent of the elements location or the users location. With this information a user can issue a command on any element within the system.

Individual stockers within a system can also be viewed directly. This can be done from any point within the fab that has access to a browser. Clicking on one of the stockers listed in the Stocker list, located in the lower left-hand corner of the UI window, changes the context viewed to be local view of the stocker only. The same commands are available except that they apply and are sent to the stocker only. An example of a stocker list is shown in Figure 4-1 Main User Interface Screen and is described further in section 4.7.1.3.

4.7.1. Screen layout

The general layout of the screen is Windows 9x/NT/2000 compatible, in that it has a menu bar along the top part of the screen and a status display along the bottom. An example is shown in Figure 4-1 Main User Interface Screen. Each user type can be configured to display different windows upon startup. Any other window that is allowed to be displayed for a given user type can be displayed by

manually selecting it through menu selection. All the default windows will also be displayed and cannot be removed or manipulated.

All configuring is done during system setup and can only be changed by an Administrator level user. A typical configuration for an operator would be to have as a default display, the port view window, the material database window, and the command queue window. Each of these windows is configurable as to location and size on the screen.

The status display contains a section for displaying a simple and short help explanation about a command. This is done when the cursor is brought over the command in question. Also on the status bar is the current time, the mode of operation of the system.

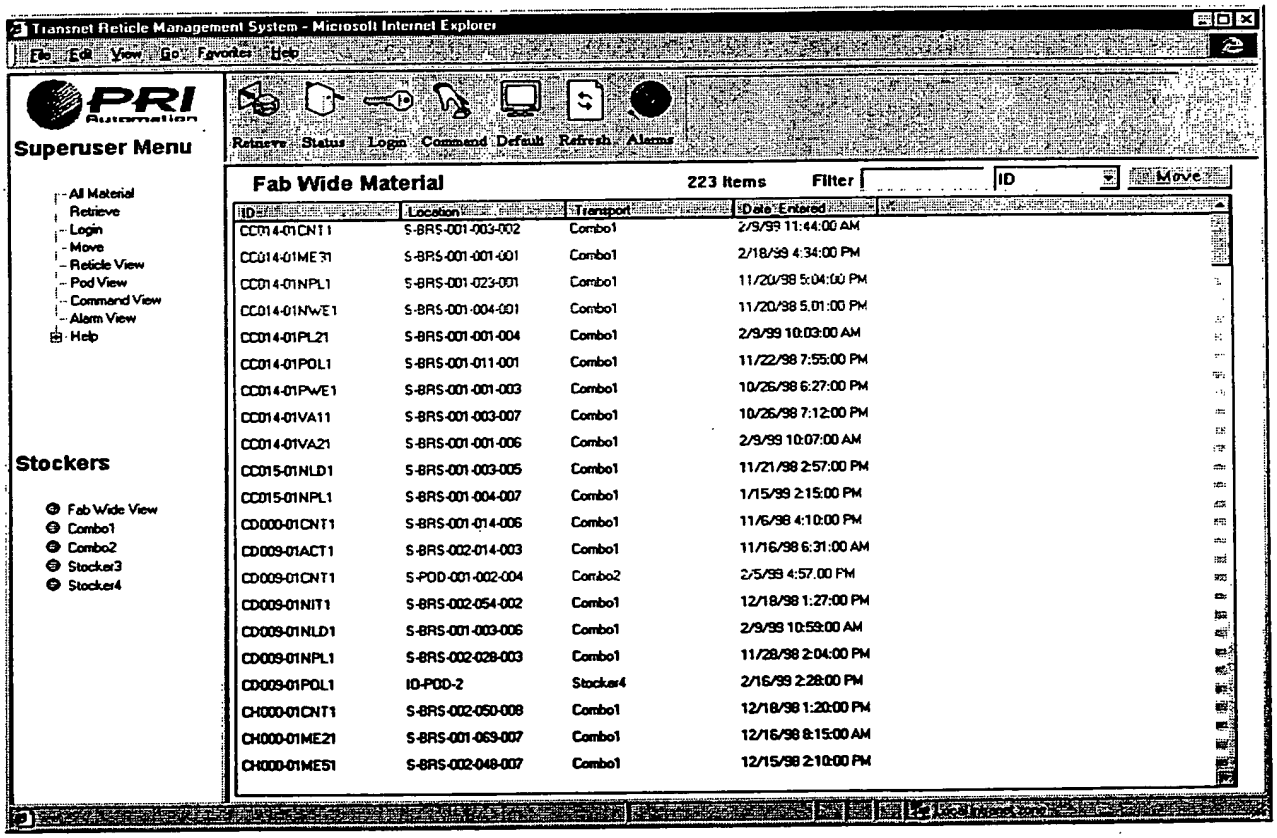

Figure 4-1 Main User Interface Screen

4.7.1.1.Material Window

The material database window is a view of the stocker inventory and associated attributes. Information within this window is shown in a tabular format. During setup, the specific columns and ordering of the columns are configured as well as the initial (default) sort.

During operation, users of the database window can re-sort the display by selecting any of the available columns. If a multi-column sort is required then this is selected using a combination of control and shift keys and the selection of columns. This is patterned after the way files are selected when using the Microsoft application file manager.

Clicking on the element, which causes it to show highlighted, selects the element. To bring an element into view, the user can either type the first letters of selected column to cause that element to be displayed in the current window then selecting it, or use the scroll bars to scroll the window up or down until the desired element is shown. Once a command has been issued against an element, its color is changed to green and no further selection is possible, until the command is completed.

Located near the top of the window is a count of the number of elements selected. If the count is zero, none have been selected, the retrieve option is disabled. If the count is one or more, the retrieve option (both from the menu bar, toolbar and button within the window) will be activated.

The Fab Wide Material frame in Figure 4-1 Main User Interface Screen is an example of the type of the window used. A view of Reticle Carriers (example shown in Figure 4-2 Reticle Carrier View (Pods)) or just reticles (example shown in Figure 4-3 Reticle View) is also selectable from the Menu portion of the screen, located in the upper left hand corner of the window.

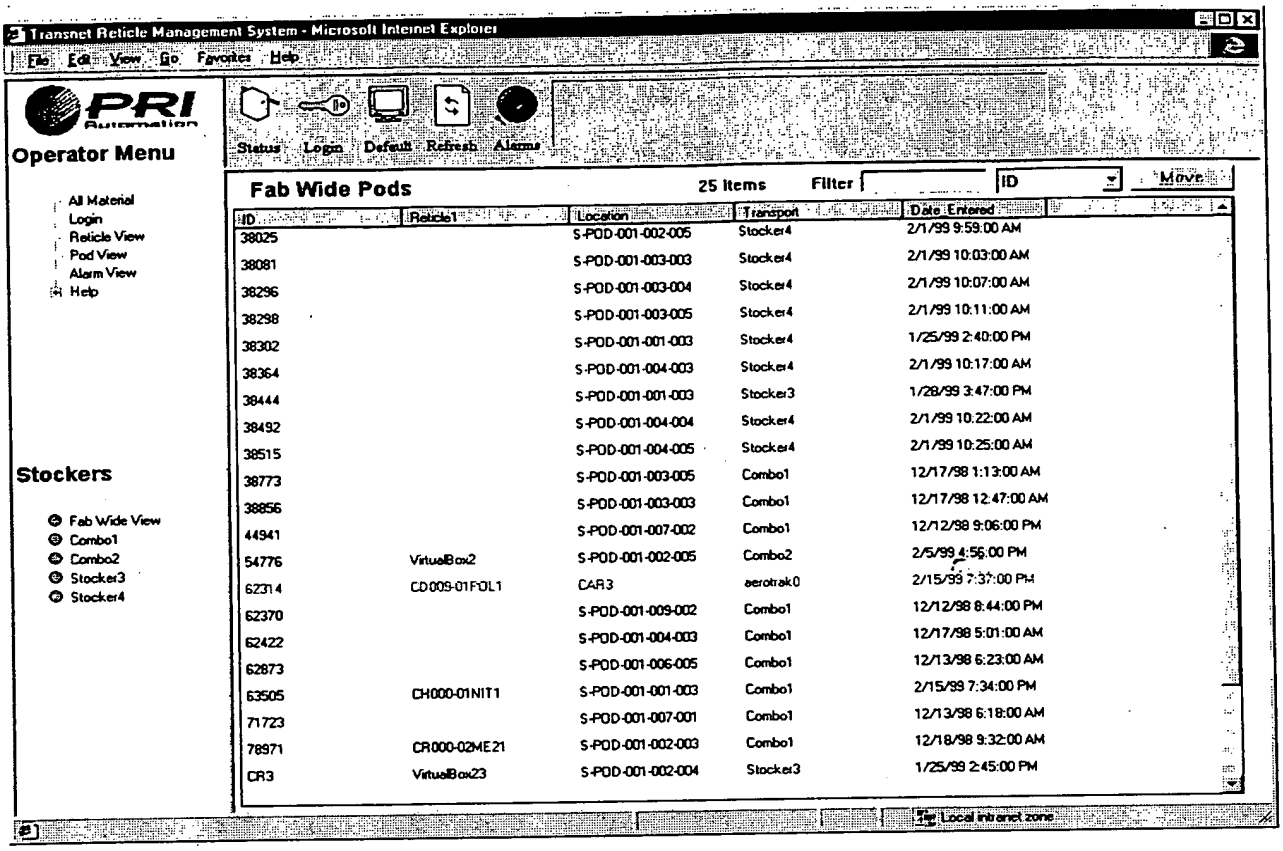

Figure 4-2 Reticle Carrier View (Pods)

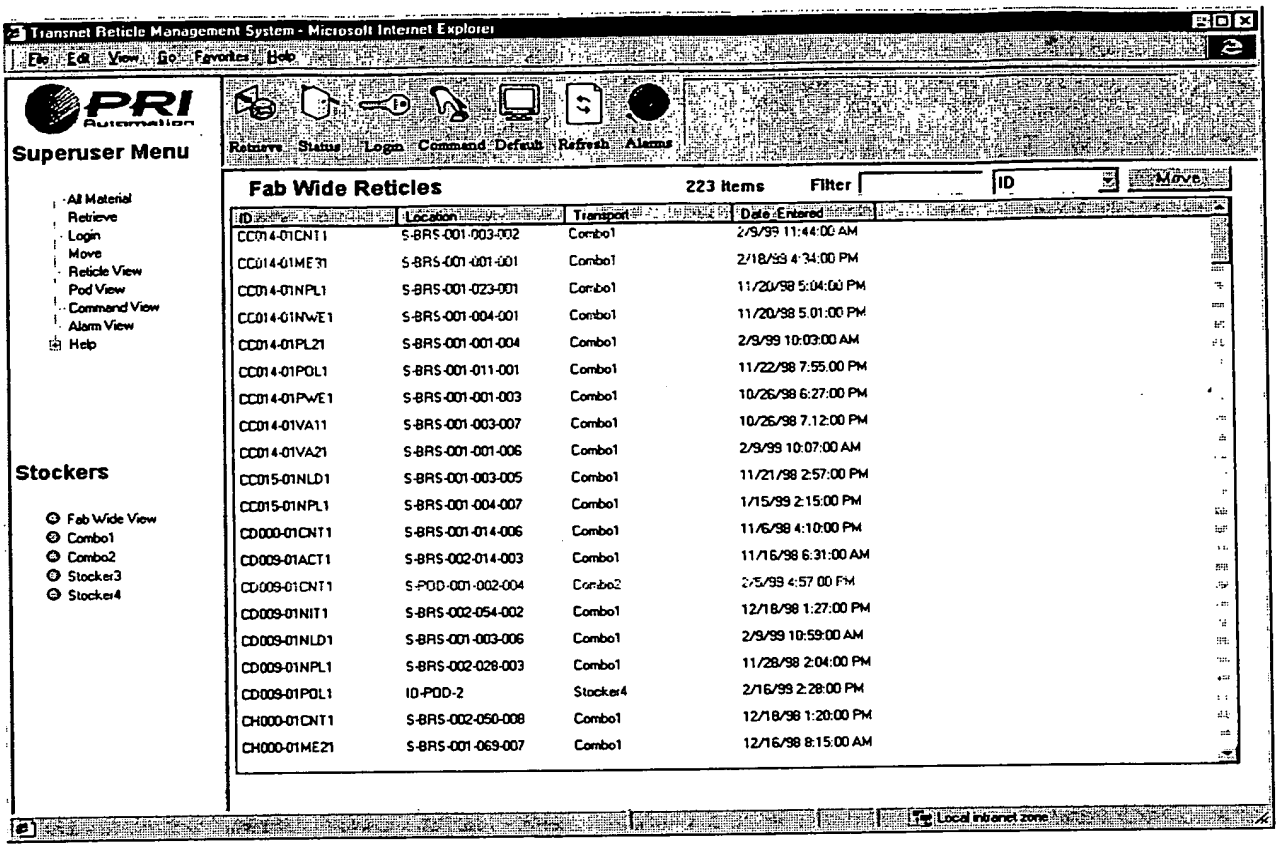

Figure 4-3 Reticle View

4.7.1.2. Command View

A listing of ongoing and outstanding commands can be view from the user interface. Users can terminate outstanding commands via this view. An example of this view is shown in Figure 4-4 Command View.

This display can be shown in two ways. One is to hit the Command button shown in the toolbar, which is located directly above the material view. Additionally this view can be shown by selecting the 'Command View' menu item from the list of command shown as part of the Menu, located in the upper left hand portion of the screen.

Selecting an outstanding command causes it to be highlighted and the Cancel button in the upper right hand corner will become enabled. Then upon hitting the Cancel button the outstanding command will be canceled and removed from the list.

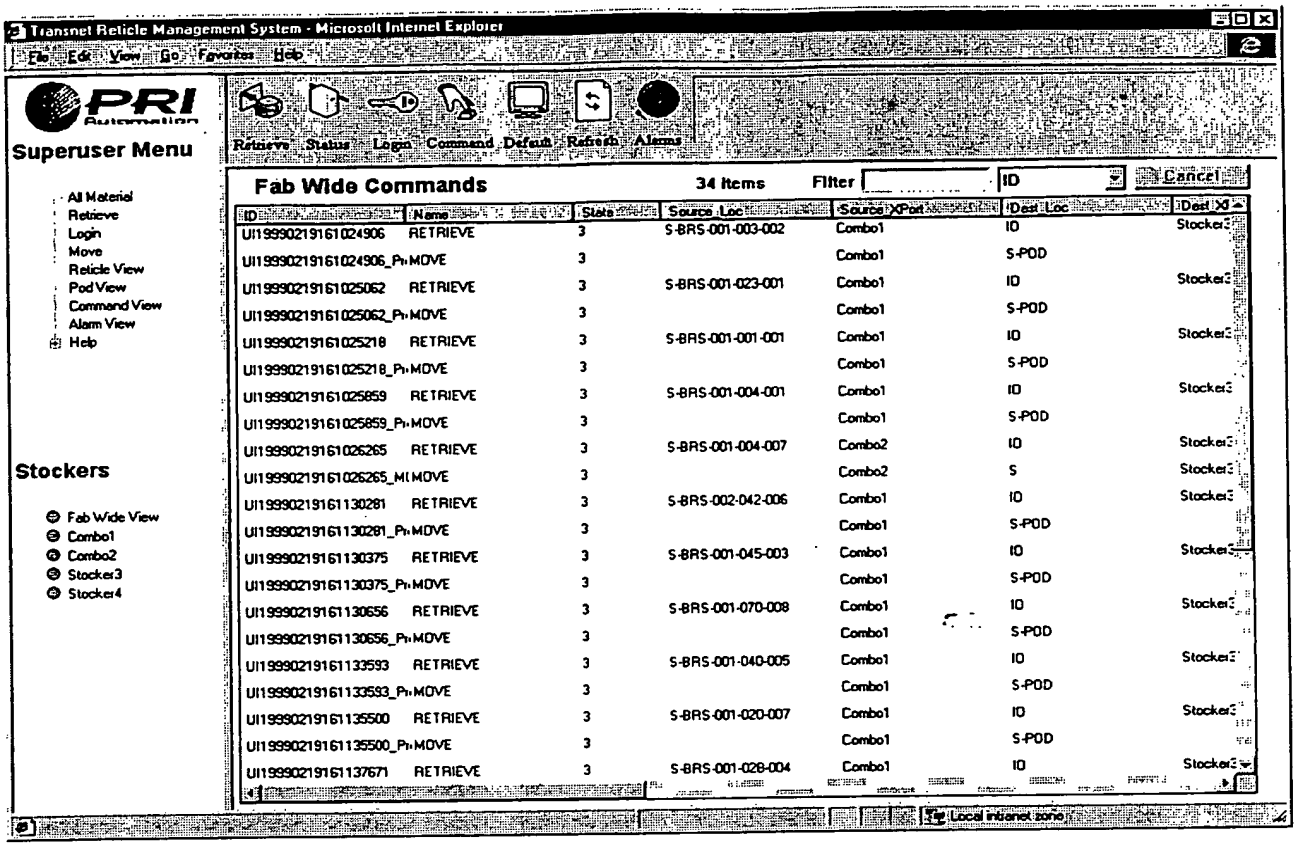

Figure 4-4 Command View

4.7.1.3.System Status

The alarm view and stocker list, shown in the lower left portion of the screen, users can see what state the system is in. Icons in the stocker list show status of an individual stockers within the system. Shown in Figure 4-5 Transport States is a listing of the possible states and how they will be represented in the stocker listing.

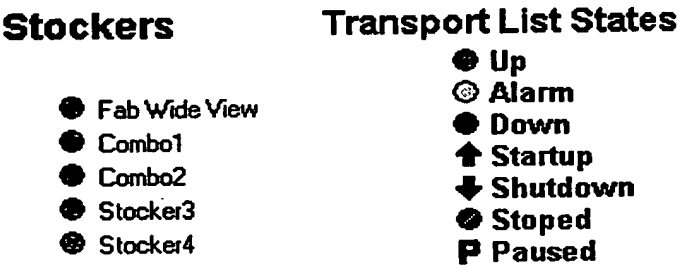

Figure 4-5 Transport States

Alarms generated by the system are shown in an Alarm view. The Alarm view can be selected in two ways. One by selecting the Alarm icon from the toolbar, which is located above the material frame. Another way is to select the 'Alarm View' item from the menu list, located in the upper left-hand corner of the screen. An example Alarm view is shown in Figure 4-6 Alarm View.

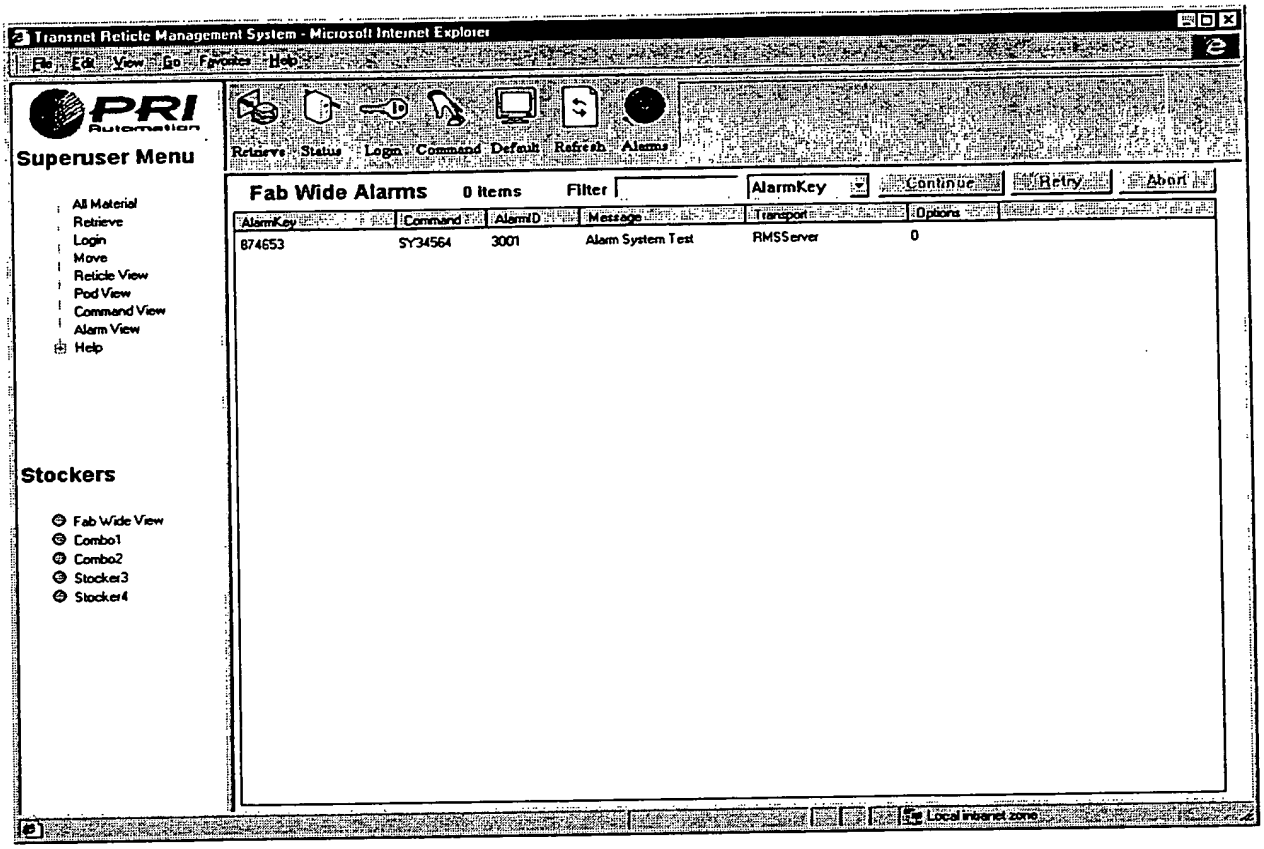

Figure 4-6 Alarm View

4.7.1.4. Editing of Reticle Data

Left clicking on an item in a material view brings up a dialog to edit reticle fields. The fields allowed to be edited is restricted based on the users rights. Below is a table of fields and what types of users can edit them.

Attribute Name	Process	Clean	Inspect	Repellicization	Repair	Hold
Reticle ID						
Reticle carrier ID						
Times Retrieved						
Date Last Retrieved						
Last Retrieve User ID	X	X	X		X	X
Times Stored	X					
Date Last Stored	X					
Last Stored User ID.	X					
Times Cleaned		X				
Date Last Cleaned		X				
Last Cleaned User ID		X				
Cleaned By		X				
Location Cleaned		X				
Times Inspected			X			
Date Last Inspected			X			
Last Inspected User ID			X			
Inspected By			X			
Location Inspected			X			
Last Kit Time						
As Reticle carrier Time						
Last Un-Kit Time						
As Bare Time						
Date Entered						
Creator User ID						
Keep Kitted						X

Current Location						
Last Location						
Last Reticle Repair					X	
Repair Count					X	
Last Re-pelliclization				X		
Re-pelliclization Count				X		
Hold Time						X
Hold User ID						X

Table 4-10 Reticle Attribute Edit Rights

PATENT APPLICATION SERIAL NO. _____

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

5/02/2000 ZABRAHA1 00000040 60199453

1 FC:114 150.00 OP

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4-26-00

A/PRO

JC553 U.S. PTO 60/199453 04/25/00

JC780 U.S. PTO 04/25/00

PROVISIONAL APPLICATION COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION under 37 CFR 1.53 (c).

BOX PROVISIONAL APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Docket Number: PRI-134q800	Type a Plus sign (+) inside this box →	+

INVENTOR(s)/APPLICANT(s)

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[ ] Additional Inventors are being named on Page 2 attached.

TITLE OF THE INVENTION (280 characters max)

RETICLE MANAGEMENT SYSTEM

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ENCLOSED APPLICATION PARTS *(CHECK ALL THAT APPLY)*

[X]	Specification	Number of pages	[38]	[ ]	Small Entity Statement
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[X] A check in the amount of $150.00 is enclosed to cover the Provisional Filing Fee

[ ] The Commissioner is hereby authorized to charge filing fees and credit Deposit Account Number 23-0804

Respectfully submitted,

SIGNATURE _____ DATE 4/25/00

TYPED or PRINTED NAME Stanley M. Schurgin REGISTRATION NO. 20,979

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